# PALEONTOLOGY.—*Fossil Mammalia from the Almy formation in western Wyoming.*[1] C. Lewis Gazin, U. S. National Museum.

In the course of investigations for the U. S. Geological Survey in western Wyoming in 1936, J. B. Reeside, Jr., B. N. Moore, and W. W. Rubey discovered several localities for fossil vertebrate remains in beds regarded as the Almy formation. These exposures were of the deeper red beds stratigraphically below the Knight, and at certain places, as observed by Rubey, unconformably below this formation as it is exposed in the vicinity of the Green River in the southwestern part of Sublette County. Unfortunately all the materials were too fragmentary for certain identification, but in 1939 Rubey, with the assistance of John Rogers, succeeded in finding a lower jaw of a species of the primate *Plesiadapis* in Almy beds exposed along La Barge Creek, about 7 miles due west of the town of La Barge in Lincoln County. The writer visited several of these localities during the summer of 1941, and with the assistance of G. F. Sternberg and Franklin Pearce he was successful in securing additional material from the La Barge Creek locality and determinable remains, including a *Coryphodon* skull and a lower jaw of *Eohippus*, from exposures at a stratigraphically higher level about 9 miles north of the La Barge Creek occurrence.

The La Barge Creek locality, sections 1 and 12, T. 26 N., R. 114 W., has produced the following forms:

*Plesiadapis rubeyi*, n. sp.
*Plesiadapis*, cf. *cookei* Jepsen
Creodont, gen. and sp. undet.
*Phenacodus almiensis*, n. sp.
*Ectocion* sp.

The very incomplete fauna here listed suggests the Clark Fork stage, or uppermost Paleocene, indicated primarily by the *Plesiadapis* material, together with the presence and suggested predominance of *Phenacodus*. The beds at this locality are a reddish, pebbly clay, partly conglomeratic. They were mapped by A. R. Schultz[2] as the northward equivalent of the Almy formation and are so regarded by Rubey, who interprets this site as being several hundred feet stratigraphically below the top of the formation.

The more northerly locality mentioned above, in the upper part of one of the branches of Dry Piney Creek, sections 23 and 24, T. 28 N., R. 114 W., has yielded but two forms, and these have been tentatively identified as *Coryphodon radians* and *Eohippus index*. The beds here were mapped by Schultz as a part of the Knight formation; Rubey, however, considers the exposures as being of the uppermost part of the Almy and possibly including the limy layers regarded as representing the Fowkes formation. In any case the beds at this point seem definitely of lower Eocene age, or Wasatchian. The two forms encountered appear most closely related to corresponding types described by Cope from the vicinity of Evanston, Wyo., presumably out of the Knight. It should be further mentioned that a few miles north of La Barge and a short distance to the east of the Dry Piney Creek locality well developed, variegated exposures of Knight have produced a Lost Cabin fauna.[3]

There follows a systematic description of the materials discovered well down in the Almy as exposed along La Barge Creek and regarded as Clarkforkian or uppermost Paleocene:

### **Plesiadapis rubeyi,** n. sp.

Fig. 1

*Type.*—Portion of right ramus of mandible with $P_3$-$M_2$, $M_1$ incomplete, U. S. N. M. no. 16696.

*Horizon and locality.*—Almy formation, NE¼SW¼ sec. 1, T. 26 N., R. 114 W., about 7 miles west of La Barge, Lincoln County, Wyo.

*Specific characters.*—A little larger than *P. gidleyi*. Lower cheek teeth long and relatively narrower than in *P. gidleyi*, particularly $P_3$ and to a less extent $P_4$. Cusps of teeth more inflated and basins a little less broadly excavated. Anteroexternal cingulum about base of protoconid weaker on $M_2$. Paraconid and metaconid on $M_2$ of about equal height and slightly closer together than in *P. gidleyi.*

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[1] Published by permission of the Secretary, Smithsonian Institution. Received March 26, 1942.

[2] Schultz, A. R., U. S. Geol. Surv. Bull. **543**, pl. 1. 1914.

[3] Bonillas, Ygnacio, Journ. Mamm. **17**: 139–142. 1936.

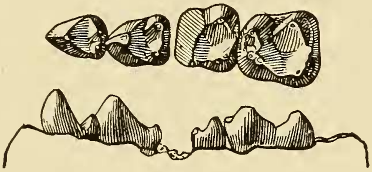

Fig. 1.—*Plesiadapis rubeyi*, n. sp. Right lower dentition, $P_3$ to $M_2$ inclusive, type specimen, U. S. N. M. no. 16696, lingual and occlusal views. ×3. Almy Paleocene, Wyoming. Drawing by Sydney Prentice.

*Description.*—*Plesiadapis rubeyi*, as indicated by the lower jaw portion, is a little larger than the Tiffany *P. gidleyi*, or than *P. dubius* of the Clark Fork. The Almy form differs from these two species principally in the actually and relatively greater anteroposterior length of the lower cheek teeth. These comparisons are facilitated by the statistics given by Simpson[4] for *P. gidleyi*. The deviation of the measurements of *P. rubeyi* from the mean of *P. gidleyi* divided by the standard deviation of *P. gidleyi* varies from +4.5 to +5.5 for the lengths of the teeth, but with no significant figures pertaining to the widths. The relation of length to width of teeth appears comparable to that in the Silver Coulee *P. fodinatus*, and the proportions of $M_2$ given by Jepsen[5] are very close to those in *P. rubeyi;* however, $M_1$ in the Almy form is strikingly smaller. No measurements were given for the premolars of *P. fodinatus*. *P. anceps* from the Scarritt Quarry[6] in the Crazy Mountain field is comparable in size with *P. rubeyi* but exhibits much shorter and simpler premolars and $M_2$ is relatively wider.

In $P_4$ of *P. rubeyi* the acute posterointernal ridge extending down the protoconid is somewhat deflected at a point about halfway down its length, suggesting an incipient metaconid. A very slight increase in the development of the anterior keel on $P_4$ immediately above the entoconid of $P_3$ might suggest a paraconid. The heel of $P_4$ is distinctly basined and exhibits two cusps, the hypoconid and entoconid. These cusps are also distinguished on $P_3$ but not so widely spaced.

TABLE 1.—MEASUREMENTS (IN MILLIMETERS) OF LOWER TEETH, NO. 16696, OF PLESIADAPIS RUBEYI

| Measurement | $P_3$ | $P_4$ | $M_1$ | $M_2$ |
|---|---|---|---|---|
| Anteroposterior diameter | 2.8 | 2.9 | 3.0* | 3.7 |
| Transverse diameter | 1.9 | 2.2 | 2.7* | 3.2 |

* Estimated.

The length of the preserved dentition, $P_3$-$M_2$ inclusive, is 12 mm.

### **Plesiadapis,** cf. cookei Jepsen

A large form of *Plesiadapis* is represented in the collection from the La Barge Creek locality (SW$\frac{1}{4}$ NE$\frac{1}{4}$ sec. 12, T. 26 N., R. 114 W.) by the greater portion of a left mandibular ramus, U. S. N. M. no. 16698. The specimen includes $P_3$, most of $P_4$, $M_2$ complete, and a small portion of $M_3$. The teeth appear to be a little larger than in the type from the Clark Fork, as indicated by Jepsen's[7] measurements, and are relatively elongate, particularly the premolars. The difference in the latter respect from the type of *P. cookei* is probably less significant than this character was found to be in comparisons of *P. rubeyi* with related species.

$P_3$ and $P_4$ both exhibit a bilobed talonid, although this portion of $P_4$ is incomplete. The rugosity of the enamel on the anterolingual portion of $P_4$ gives rise to a suggestion of a paraconid, not developed to this extent, however, on $P_3$. Neither of these teeth shows any evidence of a metaconid.

In $M_2$ the metaconid, very close to the paraconid, is posterolingual to this cusp and joined by a ridge to the protoconid. The external cingulum on this tooth is not well developed and is in evidence only from the anterolateral portion of the hypoconid to an anterior position on the protoconid. The enamel on this tooth is somewhat rugose, most noticeably about the hypoconid and on the posterior wall of the trigonid.

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[4] SIMPSON, G. G., Amer. Mus. Nov. **817**: 3–7. 1935.

[5] JEPSEN, G. L., Proc. Amer. Philos. Soc. **69**: 515–517. 1930.

[6] SIMPSON, G. G., Amer. Mus. Nov. **873**: 19–20. 1936.

[7] JEPSEN, G. L., *ibid.*, pp. 525–528. 1930.

Table 2.—Measurements (in Millimeters) of Lower Teeth, No. 16698, of Plesiadapis, cf. cookei

| Measurement | $P_3$ | $P_4$ | $M_1$ | $M_2$ | $M_3$ |
|---|---|---|---|---|---|
| Anteroposterior diameter | 5.2 | 5.3 | 5.4* | 6.4 | 10.* |
| Transverse diameter | 3.7 | ... | ... | 5.5 | ... |

* Estimated.

### Creodont, gen. and sp. undet.

A portion of an upper cheek tooth, U. S. N. M. no. 16699, including the protocone or deuterocone but externally incomplete, is regarded as representing a form of creodont. A portion of one of the external cusps is preserved, presumably the metacone, in which case the tooth resembles the posterior and lingual portions of $M^1$ in a species of *Didymictis*. The protocone and cusp presumed to be the metacone are of about equal height, although the protocone appears much more robust, and the outer angle of the tooth is evenly rounded, not projecting.

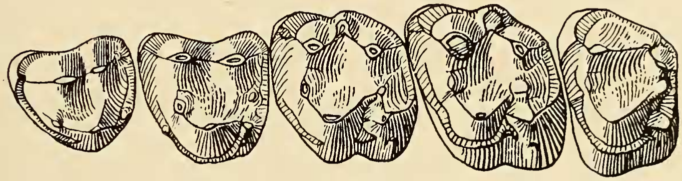

Fig. 2.—*Phenacodus almiensis*, n. sp. Left upper dentition, $P^3$ to $M^3$ inclusive ($M^3$ drawn reversed from right side), type specimen, U. S. N. M. no. 16691, occlusal view. ×2. Almy Paleocene, Wyoming.

### **Phenacodus almiensis**, n. sp.

Fig. 2

*Type.*—Partial skeleton, including palatal portion of skull with canines and cheek teeth, $P^3$ to $M^3$, cervical vertebrae, and incomplete limb and foot bones, U. S. N. M. no. 16691.

*Horizon and locality.*—Almy formation, SW$\frac{1}{4}$ NE$\frac{1}{4}$ sec. 12, T. 26 N., R. 114 W., about 7 miles west of La Barge, Lincoln County, Wyo.

*Specific characters.*—Size small with cusps of teeth relatively acute, somewhat crescentic, and uninflated. Anteroexternal and posteroexternal angles of upper teeth moderately acute. Parastyle well developed on $P^3$ to $M^3$. Slight tetartocone and protoconule on $P^3$; prominent on $P^4$ with the addition of a weak, posteriorly placed metaconule. Hypocone well developed and lingual in position on all upper molars. Metaconule in line between metacone and hypocone. Mesostyle, metacone, and metaconule distinct on $M^3$.

*Description.*—*Phenacodus almiensis* is represented by a left maxillary portion, U. S. N. M. no. 16992, including $P^4$ to $M^2$, and two isolated upper teeth, in addition to the more extensive material comprising the type. The form appears to be appreciably smaller than any of the variants included in the *Phenacodus primaevus* group.[8] It is distinctly smaller also than the Tiffany *P. grangeri*[9] but a little larger than the Gray Bull forms, *P. copei* and *P. brachypternus*. Comparisons with the Tiffany *P. matthewi* and *P. gidleyi*[9] are not satisfactory, inasmuch as these are known only from lower teeth, and none was found of *P. almiensis;* however, the difference in size indicated by these lower teeth is significant.

In comparison with material of the *Phenacodus primaevus* group, *P. almiensis* is seen to have much less inflated cusps, and these tend to be more crescentic in appearance, and the outer angles of the upper teeth are more acute. Also, the parastyles are better developed, and $P^4$ exhibits a weak metaconule. In these respects *P. almiensis* strongly resembles *Ectocion* but differs from members of that genus in important structural characters. That is, the metaconule of the upper molars is not forward in position but in line with the metacone and hypocone; also, the third upper molar is not triangular and has a rather well developed hypocone. The mesostyle, metacone, and metaconule of $M^3$ are less developed than in *Ectocion* but are more distinct than in *Phenacodus*. The hypocone in all the molars appears relatively heavy and more lingual in position than in *Ectocion.*

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[8] See Matthew, W. D., and Walter Granger, Bull. Amer. Mus. Nat. Hist. **34**: 332–348. 1915. See also Simpson, G. G., Amer. Mus. Nov. **954**: 17–19. 1937.

[9] Simpson, G. G., Amer. Mus. Nov. **817**: 22–25. 1935.

Table 3.—Measurements (in Millimeters) of Upper Teeth, No. 16691, of Phenacodus almiensis

| Measurements | C | $P^3$ | $P^4$ | $M^1$ | $M^2$ | $M^3$ |
|---|---|---|---|---|---|---|
| Anteroposterior diameter...... | 5.8 | 8.2 | 8.5 | 9.0 | 9.2 | 7.8 |
| Transverse diameter........... | 4.0 | 7.3 | 8.5 | 10.0 | 11.0 | 10.6 |

The length of the preserved portion of the dentition, $P^3$ to $M^3$, is 42.5 mm. The length of the upper molars series, $M^1$ to $M^3$, inclusive, is 25.5 mm.

### **Ectocion** sp.

A fragment of a left mandibular ramus exhibiting $P_4$ and the anterior part of the trigonid of $M_1$, U. S. N. M. no. 16695, is believed to represent a species of the condylarth *Ectocion.* The complete tooth appears to be about the size of $P_4$ in *E. ralstonensis*[10] from the Clark Fork beds. The cusps are relatively high and acute, and the pattern appears more crescentic in comparison with the inflated bunodont type of tooth seen in *Phenacodus,* although the entoconid is lacking as in that genus. However, *Ectocion ralstonensis* is described as having a relatively weak entoconid in comparison with the typical Gray Bull forms. A very slight cuspule is seen near the base of the protoconid posteriorly, as suggested in illustrations of $P_4$ belonging to the type of *E. ralstonensis,* not placed so high as observed in *Phenacodus* material. The hypoconid is more externally placed and both trigonid and talonid portions of the tooth have a much better developed crescentic pattern than in *Eohippus.* The enamel of the premolar is weakly rugose and there is a slight cingulum about the external wall.

The possibility of this specimen belonging to the form herein described as *Phenacodus almiensis* is not entirely eliminated, but the tooth is distinctly too small to occlude properly with the upper dentition of *P. almiensis.*

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[10] See Matthew, W. D., and Walter Granger, *ibid.*, p. 353. 1915.

# Obituary

Thomas Herbert Norton, distinguished author, diplomat, and research chemist, died on December 2, 1941, after a short illness.

Dr. Norton was born June 30, 1851, at Rushford, N. Y. He was graduated from Hamilton College in 1873 as valedictorian. In 1883, after many colorful experiences abroad, which were vividly described by Charles E. Monroe in the "News Edition" of the American Chemical Society for August 10, 1935, he became professor of chemistry at the University of Cincinnati. In 1900, he was appointed American consul at Harput, Turkey; in 1905 he was transferred to Smyrna, and in 1906 he went to Chemnitz, Germany. Beginning in 1911, Dr. Norton made a survey of the chemical industries of foreign countries for the Department of Commerce. When he returned to the United States he was chosen for the preparation of a report on the supply of dyestuffs for American industries. The report that he prepared revealed that foreign firms not only manufactured the chief part of the dyestuffs used in the United States, but that they employed various means to prevent the entrance of American rivals into the field of competition. Dr. Norton took a most active part in securing legislation to alleviate these unsatisfactory conditions and to foster the American chemical industry.

Dr. Norton's outstanding ability and wide interest brought him many honors and responsibilities. He received honorary degrees from Hamilton College and from the University of Heidelberg; in 1937 he received the Lavoisier Medal. Among the many scientific organizations to which he belonged was the Washington Academy of Sciences.—H.S.I.